Rock Chips
Spring 2007

Surficial Mapping in the West Steen River Area (NTS 84N/West)

During the summers of 2004 to 2006, the surficial mapping of the rugged and remote terrain of the western Steen River map area (NTS 84N) was completed. This region was mapped as an AGS contribution to the Geological Survey of Canada's multi-disciplinary project under the Northern Resource Development Program (NRD Project 4450). The map area provides continuity with the surficial mapping conducted from 2003 to 2005 in the Zama Lake (NTS 84L), Bistcho Lake (NTS 84M) and Mount Watt (NTS 84K) areas.

The Steen River region borders the Northwest Territories to the north and encompasses the MacKenzie Highway (Hwy 35), the northern road link to Yellowknife. There are two small communities here, Meander River and Indian Cabins. Despite its remoteness, this area is active with gas production and logging. Surficial maps and Quaternary studies in this region provide valuable information on the distribution and thickness of glacial sediment in support of future oil and gas infrastructure development, mineral exploration, forestry and other land use development. During the course of surficial mapping, particular attention was paid to glacial stratigraphy, ice-flow indicators, the nature of the surface sediments and the location of bedrock outcrops. Considerable progress was made in unravelling the complex glacial and deglacial history of the region. Reconnaissance-level sampling of till and glaciofluvial sediments for heavy mineral studies was completed. Samples were also collected to characterize the physical and chemical properties of the surface tills.

The physiography of the region consists of the Cameron Hills Uplands in the northern portion of the map area and the Fort Nelson Lowland along the eastern and southern margin of the map area. The Cameron Hills are characterized by extensive peatlands, underlain by near-surface permafrost. Strongly fluted terrain occurs on the hills in multiple orientations providing some insight into the complex deglacial history (Figure 1). The Fort Nelson Lowland is characterized by flat topography and expansive fens developed over the glaciolacustrine sediments of Glacial Lake Hay.

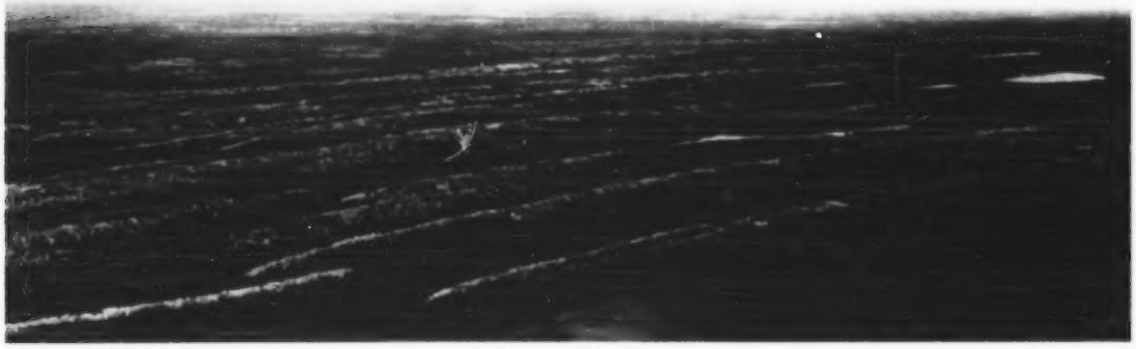

Figure 1. Streamlined landforms on the eastern edge of the Cameron Hills Uplands formed from fast-flowing ice during early deglaciation of the region. These are both erosional and constructional features of significant relief. Ice flow here is from left (east) to right (west).

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Several bedrock outcrops were discovered in the region where previous bedrock topography and drift thickness maps had suggested thick (up to 50 m) glacial deposits. Poorly indurated black shale of the Fort St. John Group outcrops along the eastern edge of the Cameron Hills Uplands and also along the Hay and Steen rivers (Figure 2).

Figure 2. Large exposure of shale bedrock in Jackpot Creek, approximately 15 km west of Highway 35.

The lowlands immediately east of the Cameron Hills Uplands have numerous outcrops exposed in streams and along highway and railway cuts. Near-surface bedrock north of Meander River hosts a unique geological feature, known as the 'Hot Pot.' This is a natural gas seep that, according to Dene Tha' elders, has been burning for thousands of years (Figure 3).

Figure 3. View of the 'Hot Pot' natural gas seep from the air, approximately 25 km north of the village of Meander River.

One of the most impressive features on the landscape is the spectacular meltwater channel (Figure 4) that starts near High Level and extends northward into the Northwest Territories. This channel was formed as Glacial Lake Peace was breached and rapidly drained. Terraces, accretionary bars and overbank sediments

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Figure 4. Jackpot Creek slowly meanders within the large drainage channel formed from the breach of Glacial Lake Peace. Accretionary bars formed in this large channel are mined for granular aggregate, such as the pit indicated here near to Highway 35 (at left).

deposited along the course of this channel now provide an important granular aggregate source for the region (Figures 5) and supply communities as far away as Zama City and High Level. Applied research on these aggregate deposits is ongoing in collaboration with the University of Calgary and the Geological Survey of Canada.

Figure 5. Coarse, clast-supported, cobble gravel overlies granular sand in this abandoned pit face. This particular pit (also indicated in Figure 4), occurs south of the Steen River Fire Base and was mined to support expansion of Highway 35 over 20 years ago; this pit and others in this remote region still have aggregate potential.

Late Wisconsin ice-flow history was reconstructed from streamlined landforms, striated boulder pavements and clast provenance studies. These observations indicate ice generally flowed across the region west to southwest during the last glacial event. During deglaciation, thinning ice was strongly affected by topography. Lobes of ice streamed over the northeastern edge of the Cameron Hills Uplands forming the strongly fluted terrain. During the last stages of glaciation, an ice lobe flowed southwestward down the Hay River valley. During deglaciation, retreating glaciers continued to impound the regional drainage. Glacial Lake Hay occupied the Fort Nelson Lowland during the early stages of deglaciation. Glacial Lake Hay was, for the most part, already drained when the breach of Glacial Lake Peace occurred on the eastern flank of Mount Watt and the glacial meltwater spilled northward through the former basin of Glacial Lake Hay, scouring and incising the landscape. The channel cut by the floodwaters is now occupied by the modern Hay River. ❖

AGS Lines Up Programs for 2007 - 2008

As part of the Alberta Energy and Utilities Board (EUB), the Alberta Geological Survey (AGS) designs its short and long-term operations according to a business planning process. The business plan focuses on operational elements for the forthcoming government fiscal year, as well as longer-term objectives. As part of this year's planning exercise, AGS renewed its commitment to its mission of providing data, information, knowledge and advice about the geology of Alberta needed by government, industry and the public for earth-resource stewardship and sustainable development in Alberta.

The core business of the AGS is to perform geological survey work at the provincial level. A geological survey is defined by the American Geological Institute as

> "The orderly and exacting process of examining, determining, finding and delineating the physical or chemical characteristics of the Earth's surface, subsurface or internal constitution by topographic, geologic, geophysical or geochemical measurements; esp. the act or operation of making detailed measurements for determining the relative positions of points on, above, or beneath the Earth's surface."

The geological survey function in government is found at both the provincial/territorial and federal levels in Canada. The complementary roles and responsibilities of provincial geological surveys and the federal survey (Geological Survey of Canada) are defined in the Intergovernmental Geoscience Accord, which is due for renewal in 2007. The manager of AGS is the provincial geologist of Alberta. The provincial geologist represents Alberta on the National Geological Surveys Committee, which governs the implementation of the Accord and fosters cross-jurisdictional survey cooperation in Canada.

AGS has five core programs supported by five technical sections, plus a leadership and management team housed in the Office of the Provincial Geologist. The Office of the Provincial Geologist also coordinates the regulatory support function of AGS within EUB.

The five core programs for the coming fiscal year are

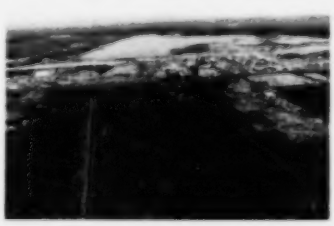
1. Geological Mapping
2. Resource Geology
3. Environmental Geology and Geological Hazards
4. Earth Systems
5. Knowledge Management.

Each program is delivered by projects and activities thematically grouped and targeted to specific goals that align with EUB business objectives and the priorities of the Government of Alberta. Through the coming year, Rock Chips will report on the objective, strategy, progress and success of each of the AGS programs.

Geological Mapping Program

Geological mapping provides the fundamental knowledge framework that supports and informs earth-resource development in Alberta. Despite more than 100 years of intensive resource exploration in Alberta, much of the province remains unmapped. This is because not all mappable horizons contain economically recoverable reserves of hydrocarbons and other resources that drive private-sector mapping. Furthermore, reserves are not equally distributed within horizons; therefore, some areas get intensely mapped and studied while others do not. In addition, geological mapping for resource exploration by the private sector is seldom released into the public domain or updated and archived. The AGS Mapping Program provides and maintains current and comprehensive geological maps of the entire province in the public domain for informed decision making by EUB and Albertans.

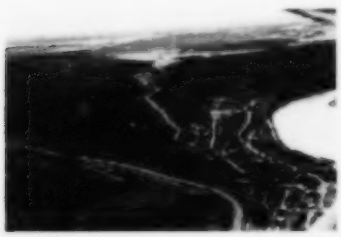
Resource Geology Program



The people of Alberta own the natural resources of the province. Exploration and development of these resources is done mostly by the private

sector under lease agreements and licenses granted by the Alberta Department of Energy and the EUB. The systems of mineral tenure, regulation, conservation and royalties are founded on scientific knowledge of the geology of these resources, as well as independent estimation of economic reserves, their location and extent, and their value in our free market system. The purpose of the AGS Resource Geology Program is to maintain and update our geological understanding of the known energy and mineral resources of Alberta and to investigate, study and explain the geology of emerging or unconventional earth resources.

Environmental Geology and Geological Hazards Program



Like people everywhere, Albertans value public health and safety as well as the integrity of the environment. Increasing population density in Alberta is leading to industrial, urban and rural development in new areas. Some of these areas have natural geological hazards requiring identification and understanding to avoid or mitigate them with engineered structures. Some new uses of underground pore space and the land create new geological hazards, as they can change the distribution of pressure and heat underground, upset natural geochemical balances, or potentially introduce unwanted pollutants or contaminants into the environment. The AGS Environmental Geology and Geological Hazards Program studies Alberta's geology and identifies geological hazards to support the informed decision making by EUB and Albertans. The program also supports ongoing geotechnical monitoring of the Frank Slide at Turtle Mountain in Crowsnest Pass, Alberta.

Earth Systems Program

The Alberta subsurface is a complex and dynamic system where water, heat and elements circulate from days to millions of years. Activities related to population growth and energy development in Alberta have grown to the size where they have the potential to significantly perturb these large-scale earth systems. These perturbations include large-scale extraction of groundwater resources in response to growth and global warming, industrial-scale underground injection of CO_2 as part of the deployment of carbon-capture and storage technologies in response to climate change, and the widespread adoption of ground-source geothermal energy systems in residences and industrial-commercial buildings to minimize CO_2 emissions and heating costs. Whereas conventional mineral and fossil-fuel developments create local footprints on the environment, the activities under study in the Earth Systems Program differ from conventional resource development in that they have the potential to alter dynamic systems in non-intuitive ways over larger areas with substantial time delays. The AGS Earth Systems Program's purpose is to adopt new tools to understand the dynamic systems in Alberta and to improve our ability to forecast consequences of these activities. This supports the ongoing evolution of an appropriate, science-based regulatory regime in Alberta, which ensures that the discovery, development and delivery of Alberta's energy resources and utility services take place in a manner that is fair, responsible and in the public interest.

Knowledge Management Program

Information, data and knowledge held by the survey are a valuable provincial asset. The information technology revolution has accelerated the rate at which we gather data and convert it into information and knowledge. This has precipitated a realization at AGS that our knowledge banks need a high degree of centralized care and maintenance delivered by information professionals. The growing demand for AGS information by other EUB branches, government departments and the public has also placed a high demand for effective and timely release of information products, maps and reports. The Knowledge Management Program will build and maintain the information technology infrastructure and develop and adopt information management best practices, policies and procedures needed to ensure our information is accessible today and preserved in a useful form for future generations. ❖

Recently Released Publications

Earth Sciences Reports

ESR 2006-05 Subsurface Characterization of Acid-Gas Injection Operations in Northeastern British Columbia. 13.1 MB PDF. $20.00

ESR 2006-06 Subsurface Geology of the Athabasca Wabiskaw-McMurray Succession: Lewis–Fort McMurray Area, Northeastern Alberta (NTS 74D/74E). 14.69 MB PDF. $20.00

ESR 2006-08 Subsurface Geology of the Athabasca Wabiskaw–McMurray Succession: Firebag-Sunrise Area, Northeastern Alberta (NTS 74D/74E). 13.9 MB PDF. $20.00

ESR 2007-03 Structural Geology of the Turtle Mountain Area Near Frank, Alberta. 22.9 MB PDF. $20.00

Geo-Notes

GEO 2006-03 Cold Lake Oil Sands Area: Formation Picks and Correlation of Associated Stratigraphy. 1.19 MB PDF. $20.00

GEO 2006-04 Field Guide: Regional Sedimentology and Processes of Deposition of the Athabasca Oil Sands, Northeast Alberta. 132 MB PDF. $20.00

Information Series

INF 135 The Occurrence, Production and Projected Consumption of Sand and Gravel in the Municipal District of Foothills. 2.63 MB PDF. $20.00

Maps

MAP 397 Surficial Geology, Moody Creek Alberta. 10.2 MB PDF. $20.00 (also released as Geological Survey of Canada, Open File 5283).

MAP 412 Surficial Geology of the La Crête Area (NTS 84K/SE). Scale 1:100 000. 3.65 MB PDF $20.00 (also released as Geological Survey of Canada Open File 5526).

MAP 413 Surficial Geology of the Bushe River – Ponton River Area (NTS 84K/NE). Scale 1:100 000. 3.88 MB PDF. $20.00 (also released as Geological Survey of Canada Open File 5525).

MAP 414 Surficial Geology of Meander River, Alberta. Scale 1:100 000. 3.88 MB PDF. $20.00 (also released as Geological Survey of Canada Open File 5461).

MAP 415 Surficial Geology of Caribou Creek, Alberta. Scale 1:100 000. 65 MB PDF. $20.00 (also released as Geological Survey of Canada Open File 5460).

Special Reports

SPE 081 Water Chemistry of Coalbed Methane Reservoirs. 48.6 MB PDF. $20.00

Story Contact Information

The following AGS staff may be contacted for further information on their articles or citations.

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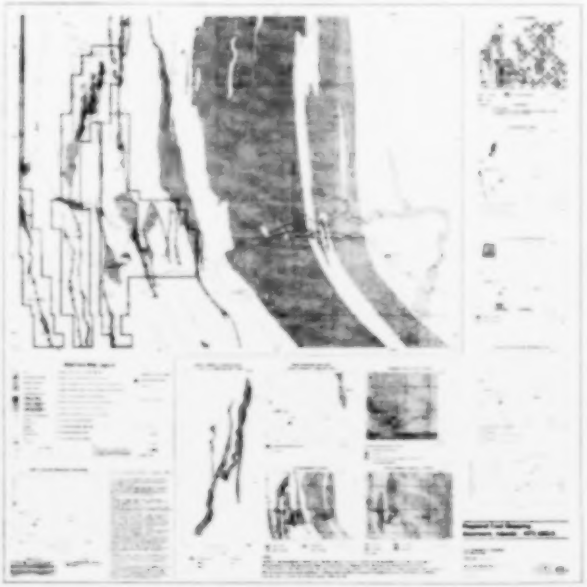
Regional Coal Maps Released in Digital Form

In 1989/1990, a three-year Coal Compilation Project (CCP) was initiated to provide coal resource maps to stimulate and support industry exploration programs and assist government in resource management. An essential feature of the program was the use of cost-effective Geographic Information System technology that allowed the database and various thematic maps to be analyzed, updated and displayed with flexibility at any scale.

Data that were compiled and evaluated were derived from the Alberta Research Council/Alberta Geological Survey, Energy Resources Conservation Board, Geological Survey of Canada, and the coal industry. Industry cooperated and supported the CCP by providing unpublished corporate reports to the AGS. The availability of these reports was an essential component toward the success of the project.

The maps from the EUB/AGS Coal Compilation reports have been scanned and are published as stand-alone maps. These maps are available for viewing and downloading at

www.ags.gov.ab.ca/publications ❖



Map 408 - Regional Coal Mapping Blairmore, Alberta - NTS 82G/9.

MAP 410 Regional Coal Mapping - Blackstone River - NTS 83C/16 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 409 Regional Coal Mapping - Cardinal River - NTS 83C/15 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 408 Regional Coal Mapping - Blairmore - NTS 82G/9 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 407 Regional Coal Mapping - Beaver Mines - NTS 82G/8 Richardson, R.J.H.; Chao, D.K.; Fietz, D., 2006.

MAP 406 Regional Coal Mapping - Donald Flats - NTS 83E/16 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 405 Regional Coal Mapping - Cutbank River - NTS 83L/10 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 404 Regional Coal Mapping - Prairie Creek - NTS 83L/7 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D.; Dawson, F.M., 2006.

MAP 403 Regional Coal Mapping - Bolton Creek - NTS 83L/2 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Dawson, F.M., 2006.

MAP 402 Regional Coal Mapping - Copton Creek - NTS 83L/3 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D.; Dawson, F.M., 2006.

MAP 401 Regional Coal Mapping - Entrance - NTS 83F/5 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 400 Regional Coal Mapping - Grande Cache - NTS 83E/14 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 399 Regional Coal Mapping - Pierre Greys Lakes - NTS 83E/15 Richardson, R.J.H.; Langenberg, C.W.; Chao, D.K.; Fietz, D., 2006.

MAP 398 Regional Coal Mapping - Moberly Creek - NTS 83E/9 Richardson, R.J.H.; Chao, D.K.; Fietz, D.; Langenberg, C.W., 2006.

Conferences Involving Alberta Geological Survey

Canadian Society of Petroleum Geologists
May 14-17, 2007
Roundup Centre, Stampede Park
Calgary, Alberta

9th Annual Unconventional Gas Conference
November 14-16, 2007
Telus Convention Centre
Calgary, Alberta

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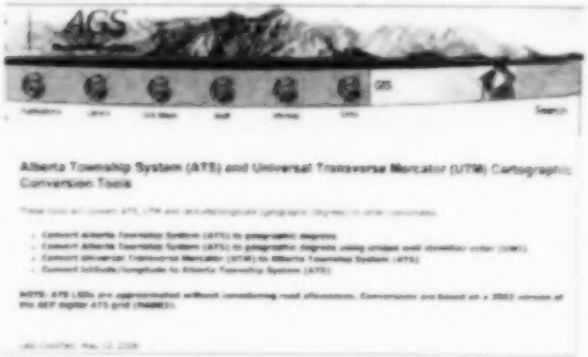
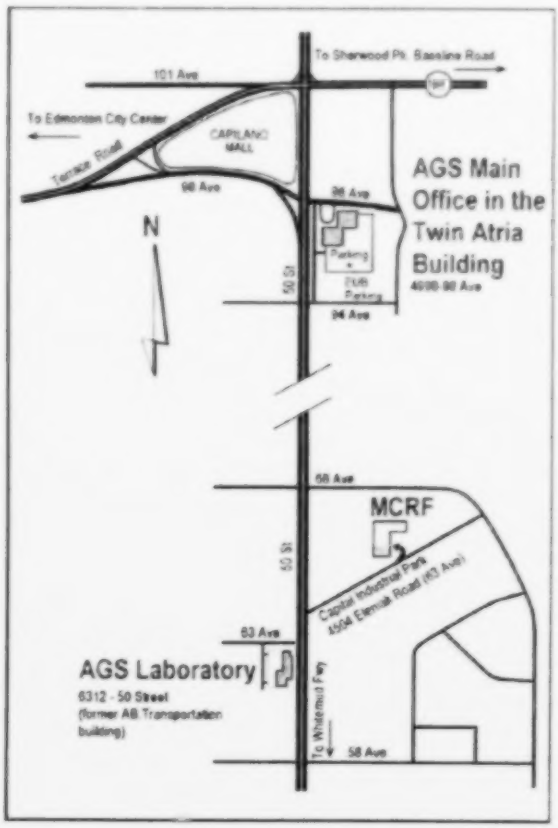
http://www.ags.gov.ab.ca/GIS/conversion_tools.shtml





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For information on the MCRF or to book a visit, contact Rob Natyshen by phone at (780) 466-1779 or by e-mail at Rob Natyshen@eub.ca